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ISAAC RAIJMAN: Now, with digital cholangioscopy, you're really going to be in a position-- we're in that position where we will change the way we approach pancreatic and biliary disorders. So there are two common scenarios. One is the complicated biliary duct stone, regardless of where the stone is in there, there is the management of strictures. But we also have to think of it, instead of just two dedicated conditions for cholangioscopy, we have to think of as a diagnostic tool as well as a therapeutic tool, because if we do that, then we expand what the indications are going to be for cholangioscopy and in the right way.

So we will look for complicated structures. We look for tissue acquisition, guidance of guidewires and so on, also as the extension of a disease. And we look for abnormal imaging, luminal filling defects, biliary dilation of unknown etiology. And then we also look for patients that have conditions that predispose them to develop cancer. And are we in a situation where we can diagnose cancer at an earlier stage?

From a therapeutic standpoint, we look for stones. And the stones can be located anywhere within the biliary tree. They had no limitations as to the reach of Spy DS and stone disease. But we also look for it in terms of wire advancement and other forms of therapy, tissue ablation, and some others.

So when we do cholangioscopy, we have two primary ways. One is peroral cholangioscopy, where we use a standard miniature endoscope and go directly into the biliary tree or we use through the duodenoscope, which will require one with two operators, one with one operator. Needless to say, these two scenarios, there are significant limitations for peroral cholangioscopy.

It's a very specific set of patients for dual operator. Obviously, it takes two operators. And I use more fragile scopes. So because all positive around effects of single operator cholangioscopy, this is what has really taken the cholangioscopy world by the hand. And this is SpyGlass DS.

So this is a wand cholangioscope that has just taken over. Many of you use it. Many of you have seen it. This is an all-inclusive design. Many improvements, either from reachability-- how far to go into the biliary tree, what we can see. The visual effects are better.

So what are the common scenarios? Two is biliary stones, and then the other one is biliary stricture. And you will have examples, like the one that you see there, where there is complicated stone disease. And then you have also the assessment of biliary strictures. And these can be anywhere within the biliary tree, either the stricture or the stone.

When it comes to stone disease, for significant stone disease, you are all familiar with the characteristics of patients that are more likely to have significant or complicated stone disease. So those patients, ahead of time, you know that you want to be doing something different.

So Marcus showed a video of a lithotripsy. We can use EHL or holmium laser. In my unit, we primarily use holmium laser. Principles are very similar. And this is a common scenario. You see a very large stone in the bile duct. It is round. It is nice to see.

The distal bile duct is narrow. So this stone will not come out. On the DS, everything comes out in the six position. You see the laser lithotripsy there. We go for the smallest fragments possible so then it facilitates extraction of the stones. And then our standard methodology to remove the stones.

What about stricture disease? This is a common scenario that we see, and you're familiar with those percentages. So most of the cholangiocarcinomas that we will be seeing are at the level of the hilum-- 65%-- and the rest are split in the rest of the biliary tree.

One of the things with the new DS is that we actually can reach deeper cholangiocarcinoma and not just at the level of the confluence. And that becomes very important when we stage locally the advancement of the disease for cholangiocarcinoma in general. So when we do cholangioscopy, we're looking for several things. One, is we're looking for diagnosis, so tissue acquisition. The other one is obviously therapy and staging.

So we know the limits of current technology. We know the limits of tissue acquisition-- 60% at best when we do standard fluoroscopy-guided brushings or biopsies and their limitations as to how far we can go into the intrahepatic biliary tree. And we also look for staging of the disease. That is, we know how cholangiocarcinoma spreads.

So when we see the patient for the first time, and this is a patient that does not have a mass on imaging studies, then we can address that patient from the beginning with cholangioscopy as well. Otherwise, the reality is when we do an ERCP without any advanced imaging of it, we're really just doing a high-risk MRCP, in which we're just injecting contrast. We're going to get the same images on MRCP.

So why not to offer from the beginning the best we can for that patient? And that is actually more significant in the hilum, because getting fluoro-guided biopsies is trickier. It is more difficult. But also, very importantly, it is where we define the extent of the disease in some patients, where some of them may be a Klatskin type II when it comes to imaging, and we oftentimes convert those to the type III and some patients type IV.

So some of the advantages, besides the visual characteristics of the lesion, then we also can get biopsies. So when we do target the biopsies, that is of significant value. It is very important. You have to take at least four per site of interest, the minimum four. I see many patients that come to me with quote-unquote "failed cholangioscopy" to make the diagnosis, even when they're doing digital cholangioscopy, and just because the biopsies are not taken adequately.

And also we assess for extent of the disease or in patients that we do not suspect disease to begin with. So one of the things that you can see in that video, when you are assessing patients with biliary strictures, you want to go past the stricture. So you want to assess the proximal extent of the disease.

As you can see in that video, initially it showed some small stones that were not seen on cholangiogram but also show the extent of the viliform changes that were proximal, which on biopsy were positive for cholangiocarcinoma, and then more distal you see now the actual stricture, which extends to the hilum.

So this patient was initially considered to be a type II, and he turned out to be a type IIIA. So this is on the right side of the liver. So we can make the diagnosis by visual as well as by biopsy, somewhere in the 72% to 94% of the patients on biopsy will get in the high 80s to 90%, as you've seen in most of the publications from this DDW.

One thing that we do in our unit is salvage cytology. So when you're doing SpyBite, take a bite, and then aspirate. You will have a cell-rich fluid. And that actually oftentimes is positive as well, even when biopsies may show the typical issue. So it's very useful.

Now what about conditions that are not typical for cholangioscopy? So I will go through some examples of patients in whom we've done cholangioscopy for dilated biliary tree for no reason, and you will see in this case is a patient with a different type of epithelial lesion. This is a BillIN-1. And not only you will not be able to see this in cholangiogram, but also it would be impossible to take a biopsy of that patient. As you can see here, you can target that biopsy quite easily and make a diagnosis.

The next case, this is a patient who has a villous-type lesion, a PanIN-2, in which the lesion itself was benign, but he had a cholangiocarcinoma just proximal to it. And this is the [INAUDIBLE] or cholangiocarcinoma. The characteristics of it are quite clear.

This is a patient who presented with acute cholangitis. I happened to be on call that weekend. Sunday, 80-year-old guy who presented with typical stone disease cholangitis. So we did ERCP, and there was a persistent filling defect at the level of the confluence, and what you will see here is a pendulous-type lesion that is at the level of the hilum.

And to your surprise, and I can guarantee you, you have never seen this. This is a pyloric gland adenoma. It's never been reported. This is the first case. So you see it before publication. So this is a 40% risk of developing cancer. So you will not be able to make this diagnosis unless you look and directly take biopsies.

This is another example. This is actually a pretty cool example. And this is something that we will try to move this forward in the future. So this is a high-risk patient, based on what you will see in her condition. But she presented with dilated biliary tree and recurrent pancreatitis. Preprocedure imaging, including a high-quality MRCP, failed to reveal any evidence of disease other than the dilated bile duct. And you saw on the cholangiogram that this patient had an anomalous connection there at pancreatobiliary system 2.5 centimeters above.

Well, what's interesting is when we saw the epithelium of the bile duct proximal to the confluence of the pancreatic duct and the bile duct, you see all that epithelium, and it showed atypia. And as we get closer to the level of the confluence, you will see soon on the right-hand side of the screen, you will see the pancreatic orifice. And you'll see the mucosa is quite abnormal, probably from all the pancreatic juice reflux. Distal to that pancreatobiliary confluence, the bile duct was completely normal. So we suggested surgery for this patient, because her risk of cancer is quite high. So she's thinking about it.

And then you will see patients like this in whom there is a typical case of PSE, where there is no evidence of disease anywhere. And this fellow just happened to have a rising alkaline phosphatase. It had been clinically elevated. And you saw there initially the scarring of the tissue, and now you see a malignant transformation. So not only you can make the diagnosis visually, but when you take biopsies, then it would be it. That's your proof of making the diagnosis in a patient that was not suspected prior to. And this is a patient that had normal bilirubin and no constitutional symptoms.

So this is something for you to memorize. But actually what I did is I just gave you these numbers. But these are all representations from DCDW, 27 abstracts, and you will notice many of them were multicenter trials. So there's a lot of cooperation really across the country and hopefully across the world for SpyGlass DS. And so these are some of the numbers for you to remember.

So this is a brief summary. And these numbers we anticipate will continue to get better and better as we all do this more and people get more used to what they see, how they take biopsies, and so on. So when we approach patients, and we recognize that there is a limitation as to what we can do or make the diagnosis prior to the cholangioscopy, why do we persist in doing the same thing over and over and over? We just perpetrate that limitation.

So it's time to change that. When it comes to therapy, we want to maximize what we're doing for the patient from the get go. So let's just be prepared from the time we see the patient to the time we treat that patient in the index procedure, perhaps we'll be able to do all at once.

So I think it's time to change, truly, the algorithm by which we approach patients with cholangiopathy, whether it is for therapeutic purposes or for diagnostic purposes. And I'm sure in the future that may be applicable also to the pancreas. So just to give you food for thought, should we do cholangioscopy in all patients? I can tell you the answer right from the get away now. It's not for all patients, but it's probably for most patients. Thank you very much.